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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/724,791	12/01/2003	Michael B. Korzenski	020732-100.686	1912
24239	7590	08/08/2006	EXAMINER	
MOORE & VAN ALLEN PLLC P.O. BOX 13706 Research Triangle Park, NC 27709			UMEZ ERONINI, LYNETTE T	
		ART UNIT	PAPER NUMBER	
			1765	

DATE MAILED: 08/08/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/724,791	KORZENSKI ET AL.	
	Examiner Lynette T. Umez-Eronini	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 15 May 2006.
- 2a) This action is **FINAL**.                            2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1-8, 12, 14, 39 and 40 is/are pending in the application.
  - 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) 39 and 40 is/are allowed.
- 6) Claim(s) 1-8, 12 and 14 is/are rejected.
- 7) Claim(s) \_\_\_\_\_ is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.
 

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) All    b) Some \* c) None of:
    1. Certified copies of the priority documents have been received.
    2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

1) <input type="checkbox"/> Notice of References Cited (PTO-892)	4) <input type="checkbox"/> Interview Summary (PTO-413)
2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)	Paper No(s)/Mail Date. _____.
3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>2/22/06</u> .	5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)
	6) <input type="checkbox"/> Other: _____.

## DETAILED ACTION

### ***Specification***

1. The amendment filed 5/15/2005 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: A sacrificial silicon-containing layer etching composition consisting essentially of and consisting of supercritical CO<sub>2</sub>, at least one co-solvent, and at least one bifluoride compound selected from the group consisting of ammonium bifluoride and tetraalkylammonium bifluoride ((R)<sub>4</sub>NHF<sub>2</sub>), wherein R is methyl, ethyl, butyl, phenyl, or fluorinated C<sub>2</sub>-C<sub>4</sub> alkyl groups, is not supported by the Specification.

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1-7, 9, 11, 12, 14, 39, and 40 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Although the

Specification broadly discloses a supercritical supercritical etchant formulation that consists or consists essentially of a supercritical fluid, at least one co-solvent, and at least one etchant, and at least one optionally surfactant [0024], the Specification fails to show an etching composition that consists of the combination of supercritical CO<sub>2</sub>, at least one co-solvent and at least one bifluoride selected from the group consisting of one bifluoride compound selected, as recited in claim 39. The Specification fails to show an etching composition that consists essentially the same, as recited in claim 40.

It is noted, "A consisting essentially of' claim occupies a middle ground between closed claims that are written in a consisting of' format and fully open claims that are drafted in a comprising' format." PPG Industries v. Guardian Industries, 156 F.3d 1351, 1354, 48 USPQ2d 1351, 1353-54 (Fed. Cir. 1998).

For search and examination purposes, absent a clear indication in the specification of what the basic and novel characteristics actually are, "consisting essentially of" will be construed as equivalent to "comprising." See, e.g., PPG, 156 F.3d at 1355, 48 USPQ at 1355 ("PPG could have defined the scope of the phrase consisting essentially of' for purposes of its patent by making clear in its specification what it regarded as constituting a material change in the basic and novel characteristics of the invention."). When an applicant contends that additional steps or materials in the prior art are excluded by the recitation of "consisting essentially of," applicant has the burden of showing that the introduction of additional steps or components would materially change the characteristics of applicant's invention.

Applicant is required to cancel the new matter in the reply to this Office Action.

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1-7, 9, 11-12, 14 and 39-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vaartstra (US 6,149,828) in view of Mullee (US 6,306,564 B1).

Vaartstra teaches exposing a substrate to a supercritical etching composition to remove inorganic material that includes silicon and silicon dioxide (column 3, lines 17-23). The supercritical etching composition includes alcohols (same as applicants' co-solvent), carbon dioxide and inert gases (e.g., He, Ne, Ar); etching components such as hydrofluoric acid, acetic acid; and surfactants (column 3, line 44 - column 4, lines 7). Vaartstra further discloses, "in any of these embodiment, the supercritical etching composition can include a component selected from the group of . . . surfactants, . . ." (column 4, lines 14-17). Hence, the above reads on,

A sacrificial silicon-containing layer etching composition, comprising a supercritical fluid (SCF), at least one co-solvent, at least one etchant species, and optionally at least one surfactant, **in claim 1**;

wherein the SCF comprises a SCF species selected from the group consisting of carbon dioxide, oxygen, argon, krypton, xenon, and ammonia, **in claim 2**;

wherein the SCF comprises carbon dioxide, **in claim 3**;

wherein the sacrificial silicon-containing layer comprises a silicon-containing species selected from the group consisting of silicon oxide and silicon nitride, **in claim 7**; and

wherein the sacrificial silicon-containing layer consists essentially of silicon, **in claim 14**.

Vaartstra differs in failing to teach wherein the etchant species comprises at least one bifluoride compound selected from the group consisting of ammonium bifluoride, tetraalkylammonium difluoride  $((R)_4NHF_2)$ , and alkyl phosphonium difluorides  $((R)_4PHF_2)$ , wherein R is a C<sub>1</sub>-C<sub>4</sub> alkyl group, **in claims 1, 39 and 40**; wherein the etchant species comprises ammonium bifluoride, **in claim 9**; wherein the co-solvent comprises at least one C<sub>1</sub>-C<sub>6</sub> alcohol, **in claim 4**; wherein the co-solvent comprises methanol, **in claim 5**; and wherein the co-solvent comprises isopropanol, **in claim 6**.

It is noted that

In claim 46, “wherein the etchant gas contains C<sub>4</sub>F<sub>8</sub>” is indefinite because the claim language fails to conform to the language of “etchant gas consisting essentially of” as recited in claim 41.

In claim 57, “C<sub>2</sub>+F gases” is indefinite because its meaning is unclear and unknown;

In claim 57, “CH<sub>4</sub>” is indefinite because it is not commensurating in scope with “an etchant gas consisting essentially of . . . as recited in independent claim 53; and

In claim 58, “wherein the etchant gas contains C<sub>4</sub>F<sub>8</sub>” is indefinite because the claim language fails to conform to the language of “ . . . etchant gas consisting essentially of” as recited in claim 53.

Mullee teaches a stripping chemical comprising: supercritical CO<sub>2</sub>, and one or more chemicals such as ammonium bifluoride in removing resist, residue, or other contaminants on a wafer (column 3, line 67 – column 4, line 39). Mullee also teaches other chemicals such as an organic solvent that includes for example, an alcohol, methanol, ethanol, or isopropanol, which may be used independently or added to remove organic contaminants from a wafer surface (column 4, lines 21-28), and may be introduced in an amount from 0.1 to 15% v<sub>c</sub>/v<sub>v</sub> (column 4, lines 28-32).

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Vaartstra’s composition by employing alcohols as specified by and ammonium bifluoride as taught by Mullee because using ammonium bifluoride along with organic and/or inorganic stripping solvent(s) supported by supercritical CO<sub>2</sub> is known to effect the removal of contaminants from a wafer surface (Mullee, column 1, lines 9-14).

7. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vaartstra (US '828) in view of Mullee (US '564 B1) as applied to claim 1 above, and further in view of Wilkinson et al. (US 5,789,505).

Vaartstra in view of Mullee differ in failing to teach wherein the nonionic surfactant is selected from the group consisting of fluoroalkyl surfactants, polyethylene glycols, polypropylene glycols, polyethylene ethers, polypropylene glycol ethers, carboxylic acid salts, dodecylbenzenesulfonic acid, dodecylbenzenesulfonic salts, polyacrylate polymers, dinonylphenyl polyoxyethylene, silicone polymers, modified silicone polymers, acetylenic diols, modified acetylenic diols, alkylammonium salts, modified alkylammonium salts, and combinations comprising at least one of the foregoing, **in claim 11**; and

wherein the nonionic surfactant comprises a modified acetylenic diol, **in claim 12.**

Wilkinson teaches acetylenic alcohols and diols have been utilized as non-ionic surfactants in cleaning applications (column 3, lines 18-21) and are contemplated to have utility in environmentally friendly cleaning operations (column 4, line 30-32 and column 5, lines 44-46). Wilkinson also teaches 0.01 to 30 wt % acetylene diol in CO<sub>2</sub> (column 4, lines 61-63). Hence, one can conclude the balance of CO<sub>2</sub> ranges from 99.09 to 70 wt %.

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Vaartstra's and Mullee's formulation by employing a surfactant as taught by Wilkinson for the purpose of using a material that is environmentally friendly.

8. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vaartstra (US '828) in view of Mullee (US 564 B1) and further in view of Wilkinson '505) as applied to claim 1 above.

Vaartstra in view of Mullee and Wilkinson differ in failing to teach wherein the etching composition comprises about 75.0 wt % to about 99.5 wt % SCF, about 0.3 wt % to about 22.5 wt % co-solvent, about 0.01 wt % to about 5.0 wt % etchant species,, based on the total weight of the composition, **in claim 13**.

However, Vaartstra in view of Mullee and Wilkinson illustrate the specific combination of a supercritical fluid, co-solvent, an etchant (bifluoride compound) species, and one surfactant in a composition is known. Hence, it would have been obvious to one having ordinary skill in the art at the time the invention was made to select any proportion of wt % of components in the combined references of Vaartstra, Mullee and Wilkinson that would accomplish the disclosed composition because it has been held that there is no invention where the difference in proportions is not critical and was ascertained by routine experimentation because the determination of workable ranges is not considered inventive. See *In re Swain and Adams*, 70 USPQ 412 (CPA 1946).

#### ***Response to Arguments***

9. Applicant's arguments filed 5/15/2006 have been fully considered but they are not persuasive. Applicants traverse the rejection of claim(s) 1-7, 11, 12, and 14 over Vaarstra (US 6,149,828) in view of Mullee (US 6,306,564) and claims 10-14 over

Vaarstra in view of Mullee and further in view of Wilkinson et al. (US 5,789,505), each under 35 §U.S.C. 103(a). Applicants argue, embodiment 1 of Vaartstra's etching composition lacks a surfactant. Applicants' argument is unpersuasive because Vaartstra discloses, ". . . in any of these embodiment, the supercritical etching composition can include a component selected from the group of . . . surfactants, . . ." (column 4, lines 14-17), which provides support for a surfactant in the etching composition of embodiment 1.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the reason to combine is to modify Vaartstra's composition by employing alcohols as specified by and ammonium bifluoride as taught by Mullee because using ammonium bifluoride along with organic and /or inorganic stripping solvent(s) supported by supercritical CO<sub>2</sub> is known to effect the removal of contaminants from a wafer surface (Mullee, column 1, lines 9-14).

Applicants argue the combination of Vaarstra in view of Mullee and further in view of Wilkinson et al. (US 5,789,505) is not obvious. Applicants' argument is unpersuasive because Wilkinson is relied upon to teach and illustrate surfactants such

as acetylenic alcohols and diols have been utilized as non-ionic surfactants in cleaning applications (column 3, lines 18-21) and are contemplated to have utility in environmentally friendly cleaning operations (column 4, line 30-32 and column 5, lines 44-46). Hence, it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Vaartstra's and Mullee's formulation by employing a surfactant as taught by Wilkinson for the purpose of using a material that is environmentally friendly.

***Conclusion***

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 571-272-1470. The examiner is normally unavailable on the First Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Art Unit 1765

Itue

August 3, 2006

NADINE NORTON  
SUPPLYING PATENT EXAMINER  
ART UNIT 1765

